

REMARKS

Claims 1-12 are pending in the present application. Claims 3, 5, 7 and 8 have been amended.

Priority Under 35 U.S.C. 119

Applicant notes the Examiner's acknowledgment of the Claim for Priority under 35 U.S.C. 119, and receipt of the certified copy of the priority document.

Drawings

Applicant notes the Examiner's acceptance of the drawings as filed along with the present application on January 20, 2004.

Claim Rejections-35 U.S.C. 102

Claims 1-12 have been rejected under 35 U.S.C. 102(e) as being anticipated by the Noya reference (U.S. Patent No. 6,513,142). This rejection is respectfully traversed for the following reasons.

Applicant respectfully submits that the technology disclosed in the Noya reference is different than that in the present application. Particularly, the Noya reference deals with a redundant array of independent discs (RAID) of an HDD, and uses an XOR function to detect a change in a block on the HDD. In contrast, the present application deals with a flash memory and uses an XOR function to change

(rewrite) data in the flash memory.

For instance, in the present application, a plurality of areas are established, and the XOR operation is performed to the data in each of these areas. If the result of the XOR operation is zero (i.e., if that area is empty), the "rewrite data" is written into that area. Accordingly, there is no processing needed for erasure of existing data. This scheme can reduce the total time for rewriting.

In contrast, the Noya reference performs an XOR operation to identify the changing block, and overwrites the new data in that block and the new parity data over the existing parity data. This rewriting (or overwriting) occurs in a fixed area where the changed data already exists. This is different than the rewriting of the present application, because the vacant area in the present application is first determined, and then the rewriting takes place in the vacant area. In the present application, rewriting does not occur if there is data already in the corresponding area.

Moreover, in the present application, the XOR operation is carried out to obtain "rewrite data" to be written in the vacant area. When reading data from the memory in the present application, the XOR operation is also carried out to find the "rewrite data" from the memory. The Noya reference does not use an XOR operation for such purposes.

Also, an embodiment of the present application has two flash memories, and each flash memory has a plurality of areas. Data is written into the areas in one of the two flash memories. In the meantime, data in the areas of the other flash memory are

deleted. This data writing and data deleting takes place at the same time, so that when one of the flash memories is filled with data, the other flash memory becomes completely empty. Later, the opposite will happen to the two corresponding flash memories. The other memory is filled with data, whereas the other memory becomes empty. Thus, the "rewrite data" can be written into the two flash memories alternately.

In general, a flash memory needs a long time for data erasure, so that data writing of flash memory takes a long time. However, if the above noted features of the present application are applied, the time required for rewriting is reduced, because data erasures always finish in one of the two flash memories when rewriting should start. The Noya reference does not teach this idea.

Claim 1 is directed to a method of writing rewrite data over existing data in a memory, the memory having a sector partitioned into a plurality of areas, the existing data being written at a same position in the respective areas. The Examiner has alleged that column 2, lines 55-67 of the Noya reference disclose existing data being written at a same position in respective areas, as featured in claim 1. Applicant respectfully disagrees for the following reasons.

Particularly, as disclosed in column 2, lines 55-67 of the Noya reference, the cached original and new blocks of data are combined using the XOR function to derive a first result, and the first result is then combined by an XOR function with the original distributed parity block, to derive a data difference. In short, these passages of the Noya reference only teach the use of the XOR function to detect a block on the HDD

which has a changed portion. This has nothing to do with the method of writing rewrite data as noted above with respect to claim 1.

The method of writing rewrite data of claim 1 includes in combination among other features "taking an exclusive-OR of the exclusive-OR data, which is obtained by the previous exclusive-OR process, and existing data at the target position in a second area". The Examiner has apparently relied upon column 2, lines 55-67 of the Noya reference as disclosing these features, asserting "The first result is then combined by the XOR function with the original distributed parity block to derive a data difference...". However, in claim 1, the previous XOR data is retained, and this previous XOR data and the data in another area (second area) undergo the XOR process. Incidentally, this process is necessary to determine or identify a vacant area. That is, if the result of the XOR process is 0, it means that the area is vacant. In contrast, in the Noya reference, the first result and the parity block undergo the XOR process to determine whether there is any change in the original data.

The method of writing rewrite data of claim 1 further includes in combination "performing a similar exclusive-OR process up to a final area, wherein...". This indicates that the exclusive-OR process is repeatedly performed until the final area is reached. That is, the "rewrite data" and the data of the first area undergo the exclusive-OR process, the result of this exclusive-OR process and the data in the second area undergo the exclusive-OR process, the result of the most recent exclusive-OR process and the data in the third area undergo the exclusive-OR process, and this is repeated

up to the final area. Incidentally, in the course of such a series of exclusive-OR processes, if the result of the exclusive-OR process is 0, (i.e., if that area is vacant), the last result of the exclusive-OR process is written into that area.

Regarding this feature of claim 1, the Examiner has asserted with respect to the Noya reference, that "since the original and new data may comprise more than one block of data, the XOR operation must be performed for each block of data". Applicant respectfully submits that this assertion by the Examiner is incorrect, because claim 1 features that the previous XOR result and the data in a next area undergo the XOR process.

The Examiner further relies upon column 3, lines 1-6 of the Noya reference which reads "...if the data difference is non-zero...the new block is written over the old block in the disk array... and the data difference is overwritten as the new parity". However, these passages of the Noya reference teach that if the data difference obtained by the XOR process is not 0, it means that the data has been changed, and therefore overwriting of the new data block into the old data block is necessary, and the data difference is overwritten as the new parity. Thus, the system of the Noya reference is different than the method for writing rewrite data of claim 1. Applicant therefore respectfully submits that the method of writing rewrite data of claim 1 distinguishes over the Noya reference as relied upon by the Examiner, and that this rejection of claims 1 and 2 is improper for at least these reasons.

Claim 3 has been rejected using the same rationale as that of claim 1. Applicant

respectfully submits that the method of writing rewrite data of claim 3 distinguishes over the Noya reference, and that this rejection of claims 3 and 4 is improper for at least somewhat similar reasons as set forth above with respect to claim 1.

The method of writing rewrite data of claim 5 includes in combination among other features "performing a similar exclusive-OR process up to final pointer data to read an ultimate area number...". Thus, in claim 5 the first pointer data and the second pointer data undergo the exclusive-OR process, and the result of this exclusive-OR process and the third pointer data undergo the exclusive-OR process. Such exclusive-OR process is repeatedly carried out up to the final pointer data in order to read the area number. Then, the data is read from the area in the sector on the basis of the area number to convert the data into the rewrite data. After that, this area number is compared with the number of the areas of the sector. If the area number is smaller than the number of the areas, the area number is incremented by 1, and then the rewrite data is written into an area having the incremented area number. If the area number is equal to the number of the areas, all the data in the sector are erased, and the rewrite data is written into the first area of the sector. Then the area number is set to 1.

Applicant respectfully submits that column 4, lines 1-8 of the Noya reference, as taken with column 2, lines 55-67, do not disclose these features. These particular portions of the Noya reference do not disclose an area number, incrementing an area number and erasing data within a sector, as featured in claim 5 as noted above.

Applicant therefore respectfully submits that the method of writing rewrite data of claim 5 distinguishes over the Noya reference as relied upon by the Examiner, and that this rejection of claims 5 and 6 is improper for at least these reasons.

The method of rewriting data of claim 7 includes in combination among other features "performing a similar exclusive-OR process up to a final selector data to read sector selection data,...". Thus, in claim 7 the first selector data and the second selector data undergo the exclusive-OR process, and the result of this exclusive-OR process and the third selector data undergo the exclusive-OR process. Such exclusive-OR process is repeatedly carried out in order to read the sector selection data. Then, one of the two sectors is selected by the sector selection data, and the data in the first area of the selected sector and the rewrite data undergo the exclusive-OR process. Then, the result of this exclusive-OR process and the data in the second area of the selected sector undergo the exclusive-OR process. Such exclusive-OR process is repeated. In the course of these exclusive-OR processes, if the data in a certain area is the initial value, then the most recent result of the exclusive-OR process is written into that area.

The Examiner has apparently relied upon column 4, lines 40-67 and column 2, lines 55-67 of the Noya reference as meeting these features. However, it is not clear how these particular portions of the Noya reference can be interpreted to meet the above noted features of claim 7. It is not understood how these particular portions of the Noya reference may be interpreted to disclose that in the event data in a certain

area is an initial value, then the most recent result of the exclusive-OR process is written into that area. Applicant therefore respectfully submits that the method of rewriting data of claim 7 distinguishes over the Noya reference as relied upon, and that this rejection of claims 7-9 is improper for at least these reasons.

The method of rewriting data into memories of claim 10 includes in combination among other features "selecting one of the two memories based on memory selection data in the control areas of the two memories". The Examiner has asserted that column 4, lines 40-67 and column 2, lines 55-67 of the Noya reference disclose these features. However, column 4, lines 40-67 of the Noya reference merely discloses that the data transfer by DMA between the host and the disk array is performed under the control of the cache manager 260. In column 2, lines 55-67 of the Noya reference, the XOR operation is disclosed merely as used to detect a block on the HDD, that is if there has been any change in that block. These passages of the Noya reference have nothing to do with selecting one of two memories, as would be necessary to meet the features of claim 10.

The method of rewriting data of claim 10 further includes in combination among other features "writing rewrite data to an area determined by the area designation data and the control area of the selected memory". The Examiner has asserted that column 3, lines 1-6 of the Noya reference disclose these features. However, column 3, lines 1-6 of the Noya reference merely discloses that when the difference value obtained by the XOR operation is not 0, it means that there is a change in a data block of the HDD,

and therefore the new data is overwritten on the old data in the disk array and the data difference is overwritten as the new parity. This has nothing to do with rewriting data to an area determined by area designation data in the control area of a selected memory, as would be necessary to meet the features of claim 10.

The method of rewriting data of claim 10 further includes in combination "erasing data in the areas of the other memory in a piecemeal manner". The Examiner has alleged that column 5, lines 45-64 of the Noya reference disclose these features. However, this particular portion of the Noya reference as relied upon discloses that when the result of the XOR operation is 0, then it is not necessary to write a new data block and associated parity in the HDD, and therefore the cache is freed by discarding unnecessary data from the cache. This has nothing to do with the above noted further features of claim 10, wherein data in areas of the other memory are erased in a piecemeal manner.

The method of of rewriting data of claim 10 further includes in combination "repeating the steps B and C...such that erasing of the data within all the areas of the other memory is completed when the rewrite data are written to all the areas of the selected memory". This makes is possible to write the rewrite data into one of the two memories alternately. This is not disclosed by the Noya reference as relied upon.

Claim 10 further includes in combination switching the roles of the two memories. The Examiner has not specifically identified how these features are disclosed in the Noya reference. Applicant therefore respectfully submits that the method of rewriting

data of claim 10 distinguishes over the Noya reference as relied upon, and that this rejection of claims 10 and 11 is improper for at least these reasons.

Claim 12 has been rejected using the same rationale as that of claim 5. Applicant respectfully submits that claim 12 distinguishes over the Noya reference as relied upon for at least the same reasons as set forth above with respect to claim 5.

Conclusion

The Examiner is respectfully requested to reconsider and withdraw the corresponding rejection, and to pass the claims of the present application to issue, for at least the above reasons.

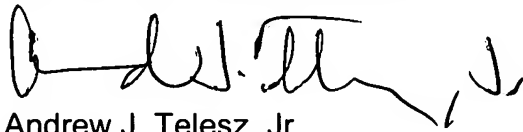
In the event that there are any outstanding matters remaining in the present application, please contact Andrew J. Telesz, Jr. (Reg. No. 33,581) at (571) 283-0720 in the Washington, D.C. area, to discuss these matters.

Pursuant to the provisions of 37 C.F.R. 1.17 and 1.136(a), the Applicant hereby petitions for an extension of one (1) month to October 28, 2005, for the period in which to file a response to the outstanding Office Action. The required fee of \$120.00 should be charged to Deposit Account No. 50-0238.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment for any additional fees that may be required, or credit any overpayment, to Deposit Account No. 50-0238.

Respectfully submitted,

VOLENTINE FRANCOS & WHITT, P.L.L.C.

A handwritten signature in black ink, appearing to read "A. J. Telesz, Jr.", with a stylized flourish at the end.

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